Technical Appendix 8.7
Habitat Loss Calculations

1. Introduction

1.1 Background

1.1.2 This technical appendix details the approach, assumptions and results of the process adopted to quantify habitat loss and disturbance/degradation as a result of the construction of the Proposed Development for the ecological impact assessment presented in **Chapter 8: Ecology**.

1.1.2 Habitat loss, disturbance and potential degradation have been estimated using the Phase 1 habitat survey results and the layout of the Proposed Development. Where there is uncertainty in design layout (dimensions, extent etc.) various assumptions have been made regarding the construction methodology to arrive at realistic 'worst case' estimates.

1.1.2 Habitat loss has been estimated using the Phase 1 habitat (**Technical Appendix 8.1**) and National Vegetation Classification (NVC) and Peatland Condition Assessment (PCA) survey results (**Technical Appendix 8.2**) and the layout of the Proposed Development.

1.2 Approach

Estimating Habitat Loss/ Potential Change

1.1.2 There are three main ways by which habitat features may be affected during the construction and operational phase of the Proposed Development:

- Direct habitat loss: to accommodate the Proposed Development infrastructure, such as the wind turbine bases, internal wind farm tracks, crane hardstandings and grid connection infrastructure (including substation and operations buildings), LIDAR compound. These losses are considered permanent in the context of this assessment.
- Disturbance/temporary habitat loss: the effects of disturbance are variable in their extent, depending on the nature of the disturbance and sensitivity of the habitat feature. Some disturbance types (for example, temporary habitat loss for the creation of construction areas) result in medium to long-term disturbance which require extended recovery periods. In other cases (for example, installation of cables at the sides of access tracks, traversing of machinery) disturbance is short-term, and certain habitat types are able to recover quickly; and,
- Indirect effects: these primarily relate to changes in hydrology of wetland habitats in the context of this development, including dewatering of habitats, disruption to flow paths and changes to drainage regime.

1.3 Footprint Calculations

1.3.1 The dimensions and extents of the various infrastructure elements for the Project (**Figure 3.1, Volume 2, EIAR**) are provided in Table 8.7.1 below.

Table 8.7.1 Dimensions and Extents of the Proposed Development

Wind Farm Component	Nature of infrastructure	Number or Length (km)	Maximum Dimensions assumed (m)
Turbines, including adjacent Crane Hardstandings and Laydown Areas	Permanent	20 turbines	
New Cut Track (and passing places)	Permanent	15.2 km	7m running surface
New Float Track	Permanent	2 km	7m running surface
LiDAR compound	Temporary	1	
Borrow Pits	Temporary	5	
Temporary Construction Compounds, including concrete batching plant area	Temporary	2	
Substation and Operations Building	Permanent	1	

1.1.2 Access tracks would be floated normally where the peat depth is greater than 1m, where practical, otherwise the tracks would be excavated and backfilled. Submerged drainage pipes would be installed across excavated tracks where hydrological sensitivities are present. Further details are provided in **Chapter 3: Description of Development**.

1.1.2 Excavated tracks are expected to extend along approximately **15.2 km**. These can have a greater impact on terrestrial habitats because of the associated earthworks, in particular where the track runs across a slope requiring a cutting and embankment to be created. Cut tracks also normally require drainage ditches.

1.1.2 Floated tracks are expected to extend along approximately **2 km**. Whilst these have the benefit of avoiding peat excavation, the extent of direct habitat loss will be generally similar to excavated tracks whilst the indirect effects on habitats (principally hydrological) are likely to extend over a smaller area.

Zone of Influence for Temporary and Indirect Habitat Loss

Temporary habitat loss - Construction Disturbance

1.2.6 As well as direct habitat losses there will be an area of ground surrounding built infrastructure which will be subject to temporary physical disturbance (for example temporary laydown areas, construction compounds comprising plant traffic and excavations, drainage ditches, cable trenches, banked cut faces/batters etc.). These areas would be subject to a 4m buffer surrounding infrastructure to allow machinery to work outwith the permanent footprint of any infrastructure component. These areas would be subject to restoration as detailed in the Construction Environmental Management Plan (CEMP) **(Technical Appendix 3.1: Outline CEMP).**

Hydrological Change – Indirect effects

1.2.7 Potential impacts on the hydrology of surface waters are addressed in detail in **Chapter 10: Hydrology and Hydrogeology**.

1.2.7 This assessment focuses on terrestrial habitats that are considered to be particularly sensitive to changes to surface water or groundwater hydrology resulting from construction activities

associated with the Proposed Development, focusing on blanket mire and wet heath communities. Although there may be some construction disturbance experienced by the surrounding drier habitats, such habitats are expected to recover in the short term and, as such, no indirect drainage effects are expected to impact or alter the quality of composition of dry habitats.

1.2.7 The upper layer of peat (the acrotelm) can extend up to 0.5m below the surface and the water table naturally fluctuates throughout the year within this layer. The deeper catotelm layer (usually more than 0.5m below the surface) is located within the water table and is permanently saturated. Unmodified blanket bog vegetation requires a permanently raised water level which is derived directly from rainfall and in the case of peat deposits on slopes also through lateral seepage of rainfall in the acrotelm. The high-water level is maintained by high rainfall and the low hydraulic conductivity at lower levels within the peat profile (hydraulic conductivity, or permeability, is negatively correlated with the degree of peat humification, which decreases with peat depth). Blanket bogs often display complexes of hydrologically connected formations, or landforms, which develop primarily in response to the underlying topography.

1.2.7 Hydrological changes including fluctuations in water levels, flows and quality and physical disturbance of the peat, leading to derogation and/or pollution of groundwater and surface water and disruption and breakdown of peat structure supporting blanket mire communities can occur for a variety of reasons:

- Soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels;
- Dewatering during construction associated with the excavation of the turbine foundations and borrow pits leading to a decline in groundwater levels;
- Site activities during construction, operation and decommissioning resulting in the release of pollutants and the subsequent contamination of groundwater;
- Physical disturbance of the peat and groundwater throughflow could occur as a result of excavation works;
- Disruption of flow paths and changes to drainage regime during construction and throughout operation can be associated with increases in runoff and less on-site water retention;
- Disruption of ground during construction leading to increased sediment loading; dewatering and/or drainage during construction disrupting groundwater support (baseflow) to watercourses; and
- Site activities during construction and operation/maintenance resulting in the release of pollutants and the subsequent contamination of surface waters.

1.2.7 Some habitats adjacent to the zone of physical construction disturbance, particularly those sensitive to changes in surface hydrology such as blanket mire, wet heath and flush communities, may be indirectly affected due to hydrological changes associated with the permanent footprint. For the purposes of this assessment a 10m hydrological disturbance zone has been assumed around all other hard infrastructure comprising access tracks, substations, compounds, storage and laydown areas.

1.2.7 Effects would be further minimised through the implementation of good practice environmental measures (Section 8.8 and Table 8.9, **Chapter 8: Ecology**), including proposals for full habitat re-instatement or restoration of temporarily disturbed habitat and the re-use of excavated peat within the Site.

1.2.10 Hydrological changes can occur through the excavation of soil and bedrock during the construction of cable trenches, where localised disruption to groundwater flow can occur. This can impact on

associated groundwater abstractions (especially shallow sources, i.e. springs and wells) or on potential GWDTEs. Discharge of groundwater/surface water contaminated during excavation may cause physical or chemical contamination to terrestrial habitats and nearby watercourses. An example of this is when blanket bog has new drainage ditches created adjacent to it, resulting in a lowering in the water level and losses of bog specialist plant species being replaced by species that can tolerate drier conditions. This change over time is regarded as an indirect loss or degradation of habitat.

1.4 Results

Habitat Loss – Direct, temporary and indirect

1.4.1 Table 8.7.2 provides the total estimated direct, temporary and indirect habitat loss from the construction of the Proposed Development based on Phase 1 habitat classifications and NVC communities.

1.4.1 Table 8.7.3 provides the total estimated direct, temporary and indirect habitat loss from the construction of the Proposed Development for specific wind farm components based on NVC communities.

1.4.1 Table 8.7.4 provides the total estimated direct, temporary and indirect habitat loss from the construction of the Proposed Development based on Peatland condition assessment categories.

Table 8.7.2 Predicted Effects to habitats from Project Infrastructure – Phase 1 habitats and NVC communities

Phase 1 habitat	NVC Community	Direct Habitat Loss (Ha)	Temporary habitat loss /disturbance (Ha)	Indirect habitat modification (Ha)	Total area of habitat affected (Ha)	Total areas of habitat within Study Area (Ha)	% of total habitat in footprint affected by construction
Blanket bog	M17a	1.70	1.93	4.74	**8.362**	**97.9**	**8.54%**
	M17b	2.48	4.66	7.06	**14.193**	**135.3**	**10.49%**
	M17b/M19	-	3.57	0.315	**3.882**	**5.88**	**66%**
	M19	0.334	0.459	0.911	**1.703**	**38.9**	**4.38%**
	M17a/M25a	-	0.271	0.02	**0.291**	**0.49**	**59.93%**
Wet heath/ Blanket bog mosaic	M15/M17	2.523	4.824	5.471	**12.818**	**44.45**	**28.84%**
Wet heath	M15b	0.083	0.0441	0.249	**0.38**	**11.83**	**3.18%**
	M15c	9.19	28.763	20.14	**58.09**	**442**	**13.13%**
	M15d	0.074	0.01	0.084	**0.167**	**3.94**	**4.24%**
Dry heath	H10a	0.343	1.19	0.94	**2.466**	**19.93**	**12.38%**
Acid flush	M6c	0.016	0.034	0.054	**0.104**	**1.52**	**6.86%**
Dry heath/acid grassland mosaic	H10a: U4	0.032	0.0681	0.088	**0.188**	**6.24**	**3.01%**
Acid grassland	U4a	-	-	0.006	**0.006**	**22.9**	**0.03%**
Marshy grassland	M25a	1.39	3.474	3.37	**8.23**	**93.83**	**8.77%**
TOTAL		**18.17**	**49.30**	**43.45**	**110.88**	**925.11**	

Table 8.7.3 Predicted Effects to NVC communities from Project Infrastructure – by wind farm components

Wind Farm Component	NVC Community	Direct Habitat Loss (Ha)	Temporary habitat loss /disturbance (Ha)	Indirect habitat modification (Ha)	Total area of habitat affected (Ha)
Temporary Construction Compounds, including concrete batching plant area	H10a	-	0.2	-	**0.2**
	M15c	-	2.98	-	**2.98**
	M25a	-	1.3	-	**1.3**
Borrow pit Search Areas **NB.** **Borrow Pit 1 sits outside the NVC Study Area**	H10a	-	0.44	0.16	**0.6**
	M15/M17	-	2.22	0.39	**2.61**
	M15c	-	14.33	1.93	**16.26**
	M17a	-	0.02	0.03	**0.05**
	M17a: M25a	-	0.27	0.02	**0.29**
	M17b	-	0.85	0.52	**1.37**
	M17b: M19	-	3.57	0.29	**3.86**
	M19	-	0.12	0.007	**0.127**
	M25a	-	0.25	0.17	**0.42**
Hardstanding (Turbines, Crane Hardstandings, Laydown Areas. Substations and operations buildings)	H10a	0.15	-	0.21	**0.36**
	M15/M17	1.36	-	1.43	**2.79**
	M15b	0.02	-	0.04	**0.06**
	M15c	4.89	-	5.07	**9.96**
	M15d	0.07	-	0.07	**0.14**

	M17a	0.41	-	0.73	**1.14**
	M17b	0.53	-	0.95	**1.48**
	M19	0.14	-	0.18	**0.32**
	M25a	0.63	-	0.73	**1.36**
	U4a	-	-	0.006	**0.006**
Lidar compound	M15c	0.0025	0.02	-	**0.023**
Lidar (landrover track)	M15c	-	0.32	-	**0.32**
Access tracks (New cut)	H10a	0.26	0.54	0.69	**1.49**
	H10a: U4	0.03	0.07	0.09	**0.19**
	M15/M17	1.49	2.61	3.47	**7.29**
	M15b	0.08	0.04	0.09	**0.14**
	M15c	5.5	11.55	15.15	**32.1**
	M15d	0.004	0.009	0.02	**0.033**
	M17a	1.36	1.91	2.79	**5.56**
	M17b	2.13	3.83	5.10	**10.73**
	M17b:M19	-	0.004	0.02	**0.024**
	M19	0.22	0.33	0.56	**1.04**
	M25a	0.91	1.92	2.7	**4.63**
	M6c	0.016	0.03	0.05	**0.096**

Access tracks (Floating track)	M15/M17	0.3	-	0.94	**1.24**
	M15b	0.06	-	0.16	**0.22**
	M15c	0.13	-	0.456	**0.586**
	M17a	0.52	-	1.67	**2.19**
	M17b	0.36	-	1.14	**1.5**
	M19	0.07	-	0.22	**0.29**
	M25a	0.03	-	0.09	**0.12**
	M6c	-	-	0.004	**0.004**

Habitat loss totals are provided in Table 8.6.2. Calculations provided in Table 8.6.3 provide habitat loss breakdowns for individual layers; however, there are instances where the loss may be double counted due to overlapping features or parcels, habitat loss totals should be referenced from Table 8.6.2.

Table 8.7.4 Predicted Effects to habitats from Project Infrastructure – Peatland Condition categories

Peatland Condition Assessment Categories	Corresponding NVC communities	Direct Habitat Loss (Ha)	Temporary habitat loss /disturbance (Ha)	Indirect habitat modification (Ha)	Total area of habitat affected (Ha)	Total areas of habitat in Study Area (Ha)	% of total habitat in footprint affected by construction
Modified	M15b/c, M15/M17, M17b/M19, M17a/M25a, M17b, M18, M19	13.01	39.85	29.78	82.64	664	**12.45%**
Modified/Drained	M15c/M17, M17a, M17b, M19, M20	0.97	1.35	2.72	5.35	27.4	**18.38%**
Modified/Drained/Actively Eroding	M17a, M17b	2.05	2.97	5.38	10.35	81.8	**12.65%**
Modified (Near Natural)	M17a	0.12	0.14	0.44	0.70	11.6	**6.07%**
Near Natural	M17a	0.23	0.21	0.72	1.15	13.3	**8.64%**
TOTAL		**16.38**	**44.52**	**38.99**	**98.88**	**798.10**	